WHAT IS CLAIMED IS:

1. A method for fragmenting an ion, where the ion is a peptide or protein ion, the method comprising the step of exciting one or more α-carbon--carbonyl carbon bonds present in the ion by exposing the ion to a source of vacuum ultraviolet radiation at a wavelength less than about 190 nm, and at an energy sufficient to fragment the peptide or protein ion by breaking at least one of the one or more α-carbon--carbonyl carbon bonds present therein.

2. The method of claim 1 wherein the source of vacuum ultraviolet radiation is at a predetermined wavelength is in the range from about 130 nm to about 175 nm.

3. The method of claim 1 wherein the source of vacuum ultraviolet radiation is at a predetermined wavelength is in the range from about 155 nm to about 160 nm.

4. The method of claim 1 wherein the source of vacuum ultraviolet radiation has a wavelength of about 157 nm.

5. The method of claim 1 wherein the source of vacuum ultraviolet radiation is a laser.

6. The method of claim 1 wherein the energy sufficient to fragment the high molecular weight ion is at least about 5 eV

7. The method of claim 1 wherein the energy sufficient to fragment the high molecular weight ion is in the range from about 5 eV to about 9 eV.

8. The method of claim 1 wherein the energy sufficient to fragment the high molecular weight ion is in the range from about 7.5 eV to about 8.5 eV.

9. The method of claim 1 further comprising the step of measuring the mass/charge ratio of the resulting fragments.

10. A method for fragmenting a high molecular weight ion, the method comprising the step of exposing the high molecular weight ion in an apparatus comprising a mass spectrometer or an ion mobility spectrometer to a source of vacuum ultraviolet radiation at a predetermined wavelength and at an energy sufficient to fragment the high molecular weight ion.

11. The method of claim 10 wherein the high molecular weight ion is an ion formed from a peptide or a protein.

12. The method of claim 10 wherein the predetermined wavelength is in the range from about 130 nm to about 175 nm.

13. The method of claim 10 wherein the predetermined wavelength is in the range from about 155 nm to about 160 nm.

14. The method of claim 10 wherein the predetermined wavelength is about 157 nm.

15. The method of claim 1 wherein the source of vacuum ultraviolet radiation is a laser.

16. The method of claim 10 wherein the energy sufficient to fragment the high molecular weight ion is at least about 5 eV

17. The method of claim 10 wherein the energy sufficient to fragment the high molecular weight ion is in the range from about 5 eV to about 9 eV.

18. The method of claim 10 wherein the energy sufficient to fragment the high molecular weight ion is in the range from about 7.5 eV to about 8.5 eV.

19. The method of claim 10 further comprising the step of measuring the mass/charge ratio of the resulting fragments.

20. The method of claim 10 wherein the exposing step is performed in an apparatus comprising a mass spectrometer or an ion mobility spectrometer.

21. A device for fragmenting a peptide or protein ion substantially at one or more of the α-carbon--carbonyl carbon bonds present in the peptide or protein ion, the device comprising a source of vacuum ultraviolet radiation adapted to deliver light at an energy sufficient to break at least one of the one or more α-carbon--carbonyl carbon bonds and produce one or more fragments of the peptide or protein ion.

22. The device of claim 21 wherein the vacuum ultraviolet radiation has a wavelength of about 157 nm.

23. The device of claim 21 wherein the source of vacuum ultraviolet radiation is a laser.

24. The device of claim 21 further comprising a mass spectrometer, where the source of vacuum ultraviolet radiation is coupled to the mass spectrometer.

25. The device of claim 24 wherein the mass spectrometer includes a first component comprising a source of radiation capable of forming the peptide or protein ion from a sample.

26. The device of claim 24 wherein the mass spectrometer includes a component capable of forming the peptide or protein ion from a sample.

27. The device of claim 26 wherein the component capable of forming the peptide or protein ion from a sample is an electrospray device.

28. The device of claim 24 wherein the mass spectrometer includes a second component comprising a first mass analyzer.

29. The device of claim 26 wherein the first mass analyzer is a time of flight mass analyzer.

30. The device of claim 24 wherein the mass spectrometer includes a third component comprising a second mass analyzer.

31. The device of claim 26 wherein the second mass analyzer is a time of flight mass analyzer.

32. The device of claim 21 further comprising an ion trap adapted for trapping the peptide or protein ion prior to fragmentation.

33. The device of claim 30 wherein the ion trap is coupled to a mass analyzing component for analyzing the one or more fragments of the peptide or protein ion.

34. The device of claim 21 further comprising a fourth component for measuring the mass/charge ratio of the one or more fragments.